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Post-Harvest Management of Immature Corn and Soybeans

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POST-HARVEST MANAGEMENT OF IMMATURE CORN AND SOYBEANS

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In years when the growing season is shortened by late planting and/or early frost, some corn and soybean seeds are still immature when the plant is killed by frost. Immature crops generally have high moisture at harvest and contain high concentrations of broken seeds (fines)and foreign material. In addition, immature corn usually has low test weight and immature soybeans often contain green-colored seeds. This article will cover drying and storage management of these low quality, immature crops.

Fines and Foreign Material

Fines and foreign material can cause major problems in drying and storage bins. Broken seeds are much more susceptible to attack by fungi (molds) and insects than are whole seeds. Foreign material in freshly harvested corn and soybeans consists mostly of stems, cobs, leaves, pods, and weeds that are wetter than the surrounding seeds and are quite susceptible to molding.

Also, fines have a greater resistance to airflow than whole seeds. Greater airflow resistance means greater power and energy requirements to provide air movement, and slower completion of drying and cooling operations. Worse yet, fines and foreign material tend to segregate when crops are handled and end up in concentrated pockets. For example, fines tend to accumulate under the spoutline. Segregation and high airflow resistance result in pockets of material that are difficult to dry and cool and are highly susceptible to spoilage. Fines and foreign material are frequently the cause of heating and spoilage in storage bins. In extreme cases, heating can escalate to cause charring and bin fires with complete loss of the crop and sometimes the storage bin.

Removing fines and foreign material is generally the best management technique. You can do this by passing the crop through a grain cleaner during transfer operations, or by pulling the centers out of bins (called coring) during or after bin filling. Fines often have good feed value, so removing fines especially makes sense when they can be fed or when they can be sold to livestock and poultry feeders.

Another option is to use some kind of mechanical grain distributor or spreader during bin filling to try to evenly distribute fines and foreign material throughout the bin. Energy requirements and storage risk will be lower if fines and foreign material are removed, but if a person decides to leave them in the crop, it's certainly better to have them uniformly distributed than to have them concentrated in one spot.

Test Weight

Immature corn usually has low test weight. (Think of test weight as a bulk density measurement, or weight of grain per unit of volume.) Corn with moderately low test weight corn can be fed to large animals without too much loss of performance, but very low test weight corn (less than about 45 lb/bu), or feeding of low test weight corn to animals that have small stomachs or to poultry can result in poor animal performance. When corn is used for processing, low test weight reduces plant throughput (lb/hr) and low test weight indicates that other corn quality parameters are also low. Because of possible feeding and processing problems, the price of low test weight corn is discounted and efforts should be made to prevent loss of test weight during drying.With fully mature corn, test weight usually increases as corn dries. But the test weight of immature corn can actually decrease if corn is dried at temperatures that are too high. Also, regardless of corn maturity, the higher the drying temperature is, the lower the final test weight is. So to get the best test weight possible with immature corn, reduce the drying temperature in gas-fired dryers, and consider combination drying, where corn is partially dried in a gas-fired dryer and drying is completed using natural or unheated air.

Other advantages to reducing drying temperature include reduction in number of dark kernels in immature corn (caused by caramelization of sugars at high temperatures), reduction in stress cracks and breakage susceptibility for corn of any maturity, and reduction in seed coat cracks and splits in soybeans. Disadvantages to reducing drying temperature include reduced drying capacity (bushels per hour) and in many cases, reduced drying efficiency (fewer bushels dried per gallon of gas).

It is often said that low test weight corn doesn't store as well as fully mature, normal test weight corn. In a preliminary corn storage test in our lab using clean high test weight and low test weight corn, we didn't see much difference in storability. This means that clean, immature corn might not present any greater storage risk than fully mature corn. The challenge for managers of immature corn is to dry and handle it gently to minimize cracking and breaking, and then to clean it before storage to remove any fines that are produced.

Moisture Content

After short growing seasons, harvest moisture is generally higher than normal, and is frequently more variable than normal. This means dryers must be managed carefully to prevent loss of crop quality and to produce the uniform moisture needed for safe storage.

Crop moisture should be checked frequently at both the inlet and outlet of the dryer, and dryer controls adjusted as needed to get uniform moisture. If you suspect that crop moisture was variable coming out of the dryer, probe storage bins and take moisture samples to try to find wet areas. Where wet spots are found, operate aeration fans to cool the bin and check frequently for signs of mold and heating. If problems develop, try moving the crop from one bin to another to mix it, or redry the crop.

As mentioned in the previous section, loss of test weight and darkening of kernels can occur if immature corn is dried at a temperature that is too high. It's difficult to predict exactly what temperature will cause color or test weight problems. The best recommendation we can make is for dryer managers to monitor quality of corn leaving the dryer and to keep reducing the temperature until quality is acceptable. Natural-air drying will definitely produce better corn quality than gas-fired drying, but the upper moisture limit for most natural-air dryers is in the low 20s. Again, combination drying can be an option: this involves partially drying corn to less than 25% moisture in a gas-fired dryer before starting the natural-air drying process.

Artificial drying of soybeans is not very common, but in years with short drying seasons, harvest moisture can be greater than the 13% moisture level needed for safe storage. Gas-fired corn dryers can be used for soybeans, but turn the temperature down to avoid excessive seed coat cracking and splitting. Natural-air corn dryers can also be used for soybeans; management is similar to that for natural-air corn dryers except that moisture limits are about two percentage points lower for soybeans than they are for corn.

Green Soybeans

Because extra processing steps and cost are involved when green colored soybeans are crushed, the price of soybeans containing green seeds is usually discounted. Discounts tend to be greater when a lot of green beans are delivered in a short period of time during harvest.

Many grain managers believe that immature, green colored soybeans will turn yellow in storage. If this is true, it would make sense to store immature beans for awhile to allow time for the color change. It is also believed, however, that immature soybeans present a greater storage risk than mature ones. In preliminary tests in our lab, we saw very little color change over six months time for green soybeans stored in a dark cabinet. But we also saw very little difference in mold growth on green and yellow soybeans stored at the same moisture content.

Even if green soybeans don't turn yellow in storage, it might still be worthwhile to store them for several months after harvest. Chances are that later in the season, soybean buyers will have greater blending opportunities and will not be as concerned about green soybeans (and thus not apply discounts that are as large). Although our preliminary studies indicate that green soybeans might not mold any faster than mature ones, managers must make sure that the moisture content is low enough for safe storage (13% or less) and that the beans don't contain excessive quantities of fines and foreign material.

Summary

Immature, low quality crops can be stored safely, but it is important to make sure the crop is clean and uniformly dry before storage. After the crop is stored, it should be aerated to cool it to about 35F for winter storage and then checked every few weeks. Corrective action (aeration, cleaning, redrying, transferring from one bin to another, or immediate use) should be taken at the first sign of mold or heating.